PHYSICAL PROPERTIES OF LOW-BOILING PHENOLS

A LITERATURE SURVEY

BY CLARENCE KARR, JR.

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UNITED STATES DEPARTMENT OF THE INTERIOR
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CONTENTS

	Page
Introduction and summary	1
Acknowledgments	1
Physical properties of low-boiling phenols	2
Phenols based on boiling points	6
Bibliography	9

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INTRODUCTION AND SUMMARY

In 1955 the Federal Bureau of Mines established a low-temperature tar laboratory at its new Appalachian Experiment Station in Morgantown, W. Va. The objective of the laboratory is to investigate the yields and chemical and physical properties of tars from low-temperature carbonization of coal, to investigate means of economically upgrading these tars, and to make available to industry and the public essential data for increasing coal utilization through the establishment of a new coal-chemical industry, based on the utilization of low-temperature tars.

Because of the obvious economic significance of phenols, as well as the relative ease with which they can be separated and analyzed, initial research has centered mainly around this class of tar constituents. It was realized early that no listing of phenols and their physical properties existed that included enough compounds to be practicable. The purpose of this paper is to make such a compilation available.

No attempt was made to insure a comprehensive survey, as this would take more time than could be justified. However, physical properties are listed for 183 different phenols boiling below 260° C. These include phenols with various combinations of the methyl, ethyl, propyl, and butyl groups as well as a few indanols and catechols.

This survey depended mostly on Chemical Abstracts. The physical properties given in the abstract were used except where the original article could be obtained conveniently. Where possible, the data from Chemical Abstracts were supplemented by the following references:

Beilsteins Handbuch Der Organischen Chemie. 4th ed., Springer-Verlag, Berlin (1955).

Coal Tar Data Book. Coal Tar Research Assoc., Gomersal, near Leeds, England (1953).

Dictionary of Organic Compounds. Oxford University Press, New York (1953).

Standard Methods for Testing Tar and Its Products. 3d ed., Standardization of Tar Products Tests Committee, London (1950).

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Compound	Boiling point, °C.			Melting point, °C.	Refractive index		Density	
	760 mm.	100 mm.	20 mm.		n_D^{20}	n_D^t	d_4^{20}	d_t^t,
C_6H_6O								
Phenol...........	182	119.5	85(89)	40.9(37)	1.5509(47)		1.073	
C_7H_8O								
2-Methylphenol...	190.8	125.5	90(89)	30.9(37)	1.5453		1.0465(95)	
3-Methylphenol...	202.2	138	101	11.5(89)	1.5398		1.0336(95)	
4-Methylphenol...	202.1	138	101(89)	34.8(37)	1.5395		1.0341(95)	
$C_8H_{10}O$								
2,3-Dimethyl-phenol.......	218	150	112	75.0(89)	1.5420(99)			
2,4-Dimethyl-phenol.......	210	143	105(89)	25.4-26(64)	1.5420^{14}(98)		1.036(63)	
2,5-Dimethyl-phenol.......	210	143	105(89)	75(109)			1.026(99)	
2,6-Dimethyl-phenol.......	201			45(99)				
3,4-Dimethyl-phenol.......	225	160	122(89)	65(63)			1.022^{17}(98)	
3,5-Dimethyl-phenol.......	219.5	155	117.5(89)	64(104)			1.016(99)	
2-Ethylphenol....	207	138.5	101.5(89)	<-18(102)	1.5335(78)		1.037(99)	
3-Ethylphenol....	214	151	114.5	-4(89)			1.0250(13)	
4-Ethylphenol....	219	153	115(89)	44.8(99)	1.5239^{25}		1.0123(60)	
$C_9H_{12}O$								
2-Ethyl-4-methyl-phenol.........	216-8(55)							
2-Ethyl-5-methyl-phenol.........	224.2			43.4(72)				
2-Ethyl-6-methyl-phenol.........	212-4(4)		$91\text{-}2_{12}$(14)					
3-Ethyl-2-methyl-phenol.........	227			71(28)				
3-Ethyl-4-methyl-phenol.........	234-5(83)		$126\text{-}9_{16}$(32)	33(28)				
3-Ethyl-5-methyl-phenol.........	233(83)			55(74)				
4-Ethyl-2-methyl-phenol.........	222(71)				1.5372^{25}		0.9796(87)	
4-Ethyl-3-methyl-phenol.........	228-30(6)		122_{15}(14)	26(28)				
5-Ethyl-2-methyl-phenol.........	223			14(71)			0.9967^{15}(14)	
2,3,4-Trimethyl-phenol.........	235-7			81(8)				
2,3,5-Trimethyl-phenol.........	233(74)			94.2-4.6(15)				
2,3,6-Trimethyl-phenol.........		144_{50}(43)	100_{14}(65)	62(83)				
2,4,5-Trimethyl-phenol.........	232			72(71)				
2,4,6-Trimethyl-phenol.........	222(54)	132_{50}(43)	110_{16}	70-1.5(59)				
3,4,5-Trimethyl-phenol.........	248-9(8)			109.3-9.6(15)				
2-n-Propylphenol.	220	158	122(89)	70(72)			1.000^{15}_{15}(14)	1.015^0(89)
3-n-Propylphenol.	228	164	127	26(89)				
4-n-Propylphenol.	232.6	166	128	22	1.5379^{25}(53)		1.009(89)	
2-Isopropylphenol	214_{745}(96)		$90\text{-}1_8$(14)	15-6	1.5315		1.012(53)	
3-Isopropylphenol	228(53)		$81_{2.5}$	26(22)				
4-Isopropylphenol	$228\text{-}9_{745}$		$112\text{-}5_{12}$(17)	61(106)	1.5302		1.0157(103)	
$C_{10}H_{14}O$								
2,3,4,5-Tetra-methylphenol...	260(69)			86-7(53)				
2,3,4,6-Tetra-methylphenol...	250			79-81(54)				
2,3,5,6-Tetra-methylphenol...	247-8			118-9(73)				
2-Methyl-4-n-propylphenol...	240(28)		117_{10}(5)	43-4(28)				
2-Methyl-5-n-propylphenol...	239.4-240.5(14)							
2-Methyl-6-n-propylphenol...			$105\text{-}7_{12}$(14)					
3-Methyl-5-n-propylphenol...		$152\text{-}4_{40}$(57)	$122\text{-}3_{10}$	11		1.5152^{30}(25)		
4-Methyl-2-n-propylphenol...			$121\text{-}3_{18}$(61)				1.018^{22}(18)	
5-Methyl-2-n-propylphenol...			129_{16}(14)					
2-Isopropyl-3-methylphenol...	228.5(94)			70-1(21)				
2-Isopropyl-4-methylphenol...	$228\text{-}9_{763}$(49)		82_3(21)	37(94)	$1.5244^{17.8}$		$0.9817^{17.8}$(49)	
2-Isopropyl-5-methylphenol...	233.5			51.5(23)	1.5227		0.9725(98)	
2-Isopropyl-6-methylphenol...	225-6(49)		$76_{3.5}$	-14.5	1.5227		0.9789^{25}(21)	
3-Isopropyl-2-methylphenol...				82-3(21)				
3-Isopropyl-4-methylphenol...				39-40(21)				
3-Isopropyl-5-methylphenol...	241(68)		$102\text{-}3_{3.5}$(21)	54(68)				
4-Isopropyl-2-methylphenol...	230-4(88)		83_3	a. 8.6 b. 28.5	1.5253(21)		0.987(88)	
4-Isopropyl-3-methylphenol...	238			114(82)				

Compound	Boiling point, °C.			Melting point, °C.	Refractive index		Density	
	760 mm.	100 mm.	20 mm.		n_D^{20}	n_D^t	d_4^{20}	d_t^t,
5-Isopropyl-2-methylphenol...	236.8-7.4(41)		132_{14}(106)	3.5	1.5238(21)		0.9772(41)	
2,4-Diethylphenol	228-30(6)				1.5218^{25}		0.9794_{25}^{25}(29)	
2,5-Diethylphenol			$126\text{-}7_{17}$	<-20(14)				
2,6-Diethylphenol				37.5-8.0(14)				
3,4-Diethylphenol			$106_{0.5}$(67)					
3,5-Diethylphenol	248			76(71)				
2-n-Butylphenol..	235	163.5	123	<-20	1.496^{15}(89)	$1.5180^{25.5}$(53)	0.975(89)	
3-n-Butylphenol..	248	179	138(89)		1.5035^{22}(14)		0.974(91)	
4-n-Butylphenol..	248	179	138	22	1.5165^{22}(89)		0.978(14)	
2-sec-Butylphenol.........	227-8		116_{21}(90)	21(89)	1.5178		0.9890_{20}^{20}(75)	
4-sec-Butylphenol.........	238(92)		$124\text{-}5_{14}$(14)	62(89)	1.5185		0.9860_{20}^{20}(75)	0.969^{25}(89)
2-Isobutylphenol.		86_6(11)	$51_{0.01}$(40)	21(11)	1.5171^{24}(40)			
4-Isobutylphenol.	235-9(87)	$92\text{-}4_8$(14)	$60_{0.01}$	52(40)	1.5319^{25}		0.9796(87)	
2-tert-Butylphenol.........	221	153	114(89)					
3-tert-Butylphenol.........	240	172	132.5(89)	41(22)				
4-tert-Butylphenol.........	239.7(37)	170	130.5(89)	98.4(37)				0.908^{114}(89)
2,3-Dimethyl-6-ethylphenol....				53-4(6)				
2,4-Dimethyl-3-ethylphenol....			128-31(32)	70-1(6)				
2,4-Dimethyl-5-ethylphenol....	242.4			39-40(6)				
2,4-Dimethyl-6-ethylphenol....	227-8(4)							
2,5-Dimethyl-3-ethylphenol....				71-2(58)				
2,5-Dimethyl-4-ethylphenol....				39-40(7)				
2,6-Dimethyl-4-ethylphenol....	228-30			36-7(6)				
3,4-Dimethyl-6-ethylphenol....				51-2(4)				
3,5-Dimethyl-2-ethylphenol....				80-81(3)				
$C_{11}H_{16}O$								
3-n-Butyl-2-methylphenol...			$117\text{-}9_{15}$	14(30)				
3-n-Butyl-4-methylphenol...			$124\text{-}6_{15}$	19(30)				
4-n-Butyl-3-methylphenol...			$132\text{-}4_{15}$	18(30)				
5-n-Butyl-2-methylphenol...			$127\text{-}9_{15}$	24(30)				
2-sec-Butyl-4-methylphenol...	237	169	129(89)	44-4.5(97)				
2-sec-Butyl-5-methylphenol...			$89\text{-}90_2$		1.5188			0.9640_{25}^{25}(22)
2-sec-Butyl-6-methylphenol...	229-31		$81.5\text{-}2_{2.5}$		1.5197(93)			
4-sec-Butyl-2-methylphenol...	242-5		123_{12}(14)					
2-Isobutyl-4-methylphenol...			106_9		1.5221		0.964_{20}^{20}(11)	
2-Isobutyl-5-methylphenol...			105_8		1.5229		0.966_{20}^{20}(11)	
2-Isobutyl-6-methylphenol...			100_9	41-2(11)				
3-Isobutyl-5-methylphenol...			142-4(14)					
2-tert-Butyl-4-methylphenol...	237	167(89)	126	52.3		1.4969^{75}		0.9247_4^{75}(81)
2-tert-Butyl-5-methylphenol...	235-7(100)		129(16)	23(100)				
2-tert-Butyl-6-methylphenol...	$225\text{-}7_{740}$(51)		118(16)	27(23)				
3-tert-Butyl-2-methylphenol...	235-7(12)							
3-tert-Butyl-5-methylphenol...			127_{11}	46-7(39)				
4-tert-Butyl-2-methylphenol...	235-7(38)		132(16)	27				0.932_4^{75}(98)
4-tert-Butyl-3-methylphenol...	240(82)		153_{29}(16)					
5-tert-Butyl-2-methylphenol...			$92\text{-}4_2$	32(22)				
2,4-Dimethyl-6-n-propylphenol.	243.5-5		$125\text{-}6_{17}$	31-2(26)				
2,5-Dimethyl-3-n-propylphenol.				72.5-3.5(58)				
2,5-Dimethyl-6-n-propylphenol.				47(79)				
2,6-Dimethyl-4-n-propylphenol.				33-4(5)				
3,4-Dimethyl-6-n-propylphenol.			$77\text{-}7.5_1$	59(80)				
2,4-Dimethyl-6-isopropylphenol	245(24)		$127\text{-}30_{17}$(23)	46-7(24)				
2,5-Dimethyl-3-isopropylphenol				78-9.5(58)				
3,4-Dimethyl-6-isopropylphenol	$250\text{-}0.5_{745}$			69-70(27)				

Compound	Boiling point, °C.			Melting point, °C.	Refractive index		Density	
	760 mm.	100 mm.	20 mm.		n_D^{20}	n_D^t	d_4^{20}	d_t^t,
6-Ethyl-2,3,4-trimethylphenol	250-2			47-9(4)				
6-Ethyl-2,4,5-trimethylphenol				65-6(4)				
2-Ethyl-4-n-propylphenol...	245-6(5)		123-5$_{10}$		1.5178^{25}(1)			
2-Ethyl-5-n-propylphenol...		126-7$_{15}$	84-5$_{0.7}$(31)					
2,4-Diethyl-5-methylphenol...	247-9(6)							
2,4-Diethyl-6-methylphenol...	234-6(6)							
2,5-Diethyl-4-methylphenol...	248-50			54-4.5(7)				
2,6-Diethyl-4-methylphenol...	229-30			48-8.5(6)				
3,5-Diethyl-4-methylphenol...				59(9)				
$C_{12}H_{18}O$								
2-Ethyl-6-methyl-4-n-propylphenol			130-3$_{15}$(5)					
2-Ethyl-5-isopropyl-3-methylphenol..........			150-3$_{26}$(57)					
2-n-Butyl-3,5-dimethylphenol..			152-5	64-5.5(57)				
2-n-Butyl-4,5-dimethylphenol..			135-40$_{8}$	43-5(101)				
2-n-Butyl-4,6-dimethylphenol..			106-8$_{3}$(101)					
4-n-Butyl-2,5-dimethylphenol..			130-2$_{4}$(101)					
4-n-Butyl-2,6-dimethylphenol..			138-46	32.5-3.5(5)				
2-sec-Butyl-4,6-dimethylphenol..			91-2.5$_{2.5}$		1.5189(93)			
2,4-Dimethyl-6-isobutylphenol..				69-70(11)				
2,5-Dimethyl-3-isobutylphenol..				61-2(58)				
2,5-Dimethyl-6-isobutylphenol..				73-4(11)				
3,4-Dimethyl-6-isobutylphenol..			107$_{3}$		1.5254		0.968$_{20}^{20}$(11)	
2-tert-Butyl-3,4-dimethylphenol..	258	187	144.7	46.0	1.5222			0.920^{80}(89)
2-tert-Butyl-4,6-dimethylphenol..	249	174	131	22.3	1.5183			0.917^{80}(89)
4-tert-Butyl-2,3-dimethylphenol..			145(16)					
4-tert-Butyl-2,5-dimethylphenol..	264	193.5	151	71.2	1.5311			0.939^{80}(89)
4-tert-Butyl-2,6-dimethylphenol..	248	176.5	135	82.4				0.916^{80}(89)
6-tert-Butyl-2,3-dimethylphenol..			139(16)					
2-tert-Butyl-4-ethylphenol.....	250	179	137	23(89)				
2-tert-Butyl-5-ethylphenol.....			129.5(16)					
2-tert-Butyl-6-ethylphenol.....			129(16)					
4-tert-Butyl-2-ethylphenol.....	257	184	141(89)					
2,4-di-n-Propylphenol..........	263$_{747}$(14)		125-6$_{10}$(101)				0.9350$_{15}^{15}$(14)	
2,5-di-n-Propylphenol..........		131-2$_{15}$	88-9$_{0.7}$(31)					
2,6-di-n-Propylphenol..........	256$_{764}$(14)		121$_{10}$	27(108)				
2,4-di-Isopropylphenol..........	248(35)		97$_{2}$	23	1.5122^{25}		0.9474$_{25}^{25}$	
2,5-di-Isopropylphenol..........			115-20$_{5}$(85)					
2,4-Diethyl-5,6-dimethylphenol..	244-6(6)							
2,5-Diethyl-4,6-dimethylphenol..	250-2			59.5-60.5(6)				
2,6-Diethyl-3,4-dimethylphenol..	246-8			47-8(6)				
2,6-Diethyl-3,5-dimethylphenol..				88(3)				
2,4,6-Triethylphenol..........	244-6(6)		126.5$_{5}$				0.9504^{25}(36)	
$C_{13}H_{20}O$								
3-Methyl-2,4,6-triethylphenol..	256-8(6)							
4-Methyl-2,3,6-triethylphenol..	242-4(6)							
6-Methyl-2,4,5-triethylphenol..	252			28-9(6)				
2,6-Di-n-propyl-4-methylphenol..			138-42$_{17}$		1.5122^{25}		0.950(61)	
2,4-Di-isopropyl-5-methylphenol..	261$_{745}$				1.5135^{25}		0.9445^{25}(96)	
2,4-Di-isopropyl-6-methylphenol..	253-6$_{745}$				1.5123^{25}		0.9477^{25}(96)	

Compound	Boiling point, °C.			Melting point, °C.	Refractive index		Density	
	760 mm.	100 mm	20 mm.		n_D^{20}	n_D^t	d_4^{20}	$d_{t'}^t$
2,6-Di-isopropyl-4-methylphenol..	249-50				1.5193^{25}		0.9661^{25}(96)	
3,5-Di-isopropyl-2-methylphenol..				74.5-5.5(21)				
2-n-Butyl-5-n-propylphenol....		137-9$_{30}$	87$_{0.8}$(31)					
$C_{14}H_{22}O$								
2-tert-Butyl-4-sec-butylphenol.	255-6				1.5078(93)			
2-tert-Butyl-4-isobutylphenol..	259-60		105-6$_{2.5}$		1.5070(93)			
2,4-Di-tert-butylphenol.....	263.5	190	146	56.5(89)				
2,5-Di-tert-butylphenol.....				120.5-21(52)				
2,6-Di-tert-butylphenol.....	253		94-8$_{5.6}$(50)	39(89)				
2,6-Di-isobutylphenol..........			118$_{6}$		1.5300		0.958$^{20}_{20}$(11)	
$C_{15}H_{24}O$								
2,4-Di-isobutyl-5-methylphenol..			120$_{4}$		1.5070		0.924$^{20}_{20}$(11)	
2,4,6-Tri-isopropylphenol.	249(96)		125$_{7}$(20)		1.5118^{25}		0.9497^{25}(96)	
$C_9H_{10}O$								
4-Indanol........	245$_{764}$(73)		120$_{12}$(48)	a. 39.5-40.5 b. 49-50 (2)				
5-Indanol........	255			55(53)				
$C_{10}H_{12}O$								
3-Methyl-4-indanol.........	250(28)							
5-Methyl-4-indanol.........	250			100(28)				
6-Methyl-4-indanol.........				82-3(28)				
6-Methyl-5-indanol.........				83-4(44)				
$C_{12}H_{16}O$								
1,1,2-Trimethyl-5-indanol.......	240-50			121(86)				
1,3,3-Trimethyl-6-indanol.......	263-7			119(86)				
$C_6H_6O_2$								
Catechol.........	245			105(45)			1.370(70)	
$C_7H_8O_2$								
3-Methyl-cathechol.......	241(56)		134-6$_{15}$(77)	68(56)				
4-Methyl-catechol........	251	210-15$_{190}$	143-6	65		1.5425$^{73.6}$		1.1287$_4^{73.6}$(53)
$C_8H_{10}O_2$								
3,4-Dimethyl-catechol........	253(19)			84-5(10)	1.5609		1.1426^{25}(19)	
3,5-Dimethyl-catechol........	261(10)			71(76)				
3,6-Dimethyl-catechol........	244-9(10)			104(76)				
4,5-Dimethyl-catechol........				86-7(66)				
3-Ethyl-catechol........			130-1$_{15}$(84)					
4-Ethyl-catechol........		172-5$_{35}$	157-60$_{19}$(14)	41-2(107)	1.5345^{15}		1.0757^{15}(14)	
$C_9H_{12}O_2$								
3-n-Propyl-catechol........			112-13$_{1.5}$(42)	92(107)				
4-n-Propyl-catechol........		175-80$_{30}$(33)	152$_{13}$(46)	60(33)	1.4440^{18}		1.100^{18}(46)	
4-Iso-propyl-catechol........	270-2		167-9$_{26}$	78(34)				

PHENOLS BASED ON BOILING POINTS

Compound	Boiling point, °C.		
	760 mm.	100 mm.	20 mm.
Phenol	182	119.5	85
2-Methylphenol	190.8	125.5	90
2,6-Dimethylphenol	201		
4-Methylphenol	202.1	138	101
3-Methylphenol	202.2	138	101
2-Ethylphenol	207	138.5	101.5
2,4-Dimethylphenol	210	143	105
2,5-Dimethylphenol	210	143	105
2-Ethyl-6-methylphenol	212-4		$91\text{-}2_{12}$
3-Ethylphenol	214	151	114.5
2-Ethyl-4-methylphenol	216-8		
2,3-Dimethylphenol	218	150	112
2-Isopropylphenol	214_{745}		$90\text{-}1_{8}$
4-Ethylphenol	219	153	115
3,5-Dimethylphenol	219.5	155	117.5
2-n-Propylphenol	220	158	122
2-tert-Butylphenol	221	153	114
4-Ethyl-2-methylphenol	222		
2,4,6-Trimethylphenol	222	132_{50}	110_{16}
5-Ethyl-2-methylphenol	223		
2-Ethyl-5-methylphenol	224.2		
3,4-Dimethylphenol	225	160	122
2,3,6-Trimethylphenol		144_{50}	100_{14}
2-Isopropyl-6-methylphenol	225-6		$76_{3.5}$
3-Ethyl-2-methylphenol	227		
2,4-Dimethyl-6-ethylphenol	227-8		
2-sec-Butylphenol	227-8		116_{21}
2-tert-Butyl-6-methylphenol	$225\text{-}7_{740}$		118
3-n-Propylphenol	228	164	127
3-Isopropylphenol	228		$81_{2.5}$
2-Isopropyl-4-methylphenol	$228\text{-}9_{763}$		82_{3}
2-Isopropyl-3-methylphenol	228.5		
2-Isobutylphenol		86_{6}	$51_{0.01}$
3-n-Butyl-2-methylphenol			$117\text{-}9_{15}$
4-Ethyl-3-methylphenol	228-30		122_{15}
2,4-Diethylphenol	228-30		
2,6-Dimethyl-4-ethylphenol	228-30		
2,6-Diethyl-4-methylphenol	229-30		
3,4-Diethylphenol			$106_{0.5}$(?)
2-sec-Butyl-6-methylphenol	229-31		$81.5\text{-}2_{2.5}$
2-Methyl-6-n-propylphenol			$105\text{-}7_{12}$
2,4,5-Trimethylphenol	232		
4-Methyl-2-n-propylphenol			$121\text{-}3_{18}$
4-n-Propylphenol	232.6	166	128
3-Ethyl-5-methylphenol	233		
2,3,5-Trimethylphenol	233		
2-Isopropyl-5-methylphenol	233.5		
4-Isopropylphenol	$228\text{-}9_{745}$		$112\text{-}5_{12}$
4-Isopropyl-2-methylphenol	230-4		83_{3}
2,5-Diethylphenol			$126\text{-}7_{17}$
3,4-Dimethyl-6-n-propylphenol			$77\text{-}7.5_{1}$

Compound	Boiling point, °C.		
	760 mm.	100 mm.	20 mm.
2-sec-Butyl-5-methylphenol			89-90$_{2}$
2-Ethyl-5-n-propylphenol		126-7$_{15}$	84-5$_{0.7}$
3-n-Propyl-6-n-butylphenol		137-9$_{30}$	87$_{0.8}$
3-Ethyl-4-methylphenol	234-5		126-9$_{16}$
5-Methyl-2-n-propylphenol			129$_{16}$
2-n-Butylphenol	235	163.5	123
3-n-Butyl-4-methylphenol			124-6$_{15}$
5-n-Butyl-2-methylphenol			127-9$_{15}$
2,4-Diethyl-6-methylphenol	234-6		
2,3,4-Trimethylphenol	235-7		
3-tert-Butyl-2-methylphenol	235-7		
2-tert-Butyl-5-methylphenol	235-7		129
4-tert-Butyl-2-methylphenol	235-7		132
2-tert-Butyl-4-methylphenol	237	167	126
2-sec-Butyl-4-methylphenol	237	169	129
2-tert-Butyl-6-ethylphenol			129
2-tert-Butyl-5-ethylphenol			129.5
2,4-Dimethyl-3-ethylphenol			128-31
3-Ethylcatechol			130-1$_{15}$
2,5-di-n-Propylphenol		131-2$_{15}$	88-9$_{0.7}$
2-Methyl-4-n-propyl-6-ethylphenol			130-3$_{15}$
4-n-Butyl-3-methylphenol			132-4$_{15}$
5-Isopropyl-2-methylphenol	236.8-7.4		132$_{14}$
4-Isopropyl-3-methylphenol	238		
4-sec-Butylphenol	238		124-5$_{14}$
4-Isobutylphenol	235-9	92-4$_{8}$	60$_{0.01}$
2-Isobutyl-6-methylphenol			100$_{9}$
4-tert-Butylphenol	239.7	170	130.5
2-Isobutyl-5-methylphenol			105$_{8}$
2-Isobutyl-4-methylphenol			106$_{9}$
2-Methyl-4-n-propylphenol	240		117$_{10}$
3-tert-Butylphenol	240	172	132.5
4-tert-Butyl-3-methylphenol	240		153$_{29}$
2-Methyl-5-n-propylphenol	239.4-240.5		
3-Isopropyl-5-methylphenol	241		102-3$_{3.5}$
3-Methylcatechol	241		134-5$_{15}$
2,4-Dimethyl-5-ethylphenol	242-4		
4-Methyl-2,3,6-Triethylphenol	242-4		
3,4-Dimethyl-6-isobutylphenol			107$_{3}$
4-Indanol	245$_{764}$		120$_{12}$
4-sec-Butyl-2-methylphenol	242-5		123$_{12}$
2,4-Dimethyl-6-n-propylphenol	243.5-5		125-6$_{17}$
2,4-Dimethyl-6-isopropylphenol	245		127-30$_{17}$
Catechol	245		
2-n-Butyl-4,6-dimethylphenol			106-8$_{3}$
2,6-di-Isobutylphenol			118$_{6}$
2,5-di-Isopropylphenol			115-20$_{5}$
3-Methyl-5-n-propylphenol		152-4$_{40}$	122-3$_{10}$
2,4-Diethyl-5,6-dimethylphenol	244-6		126.5$_{5}$
2,4,6-Triethylphenol	244-6		
2-Ethyl-4-n-propylphenol	245-6		123-5$_{10}$
3-tert-Butyl-5-methylphenol			127$_{11}$
2,4-Dimethyl-6-sec-butylphenol			91-2.5$_{2.5}$

	Boiling point, °C.		
Compound	760 mm.	100 mm.	20 mm.
5-tert-Butyl-2-methylphenol			92-4$_{2}$
2,4-di-Isobutyl-5-methylphenol			120$_{4}$
2,6-Diethyl-3,4-dimethylphenol	246-8		
2,3,5,6-Tetramethylphenol	247-8		
3,5-Diethylphenol	248		
4-tert-Butyl-2,6-dimethylphenol	248	176.5	135
3-n-Butylphenol	248	179	138
4-n-Butylphenol	248	179	138
2,4-di-Isopropylphenol	248		97$_{2}$
3,6-Dimethylcatechol	244-9		
2,4-Diethyl-5-methylphenol	247-9		
3,4,5-Trimethylphenol	248-9		
2-tert-Butyl-4,6-dimethylphenol	249	174	131
2,4,6-Tri-isopropylphenol	249		125$_{7}$
1,1,2-Tri-methyl-5-indanol	240-50		
2,5-Diethyl-4-methylphenol	248-50		
2,6-di-Isopropyl-4-methylphenol	249-50		
2,3,4,6-Tetramethylphenol	250		
2-tert-Butyl-4-ethylphenol	250	179	137
3-Methyl-4-indanol	250		
5-Methyl-4-indanol	250		
6-tert-Butyl-2,3-dimethylphenol			139
4-Methylcatechol	251	210-15$_{190}$	143-6
6-Ethyl-2,3,4-trimethylphenol	250-2		
2,5-Diethyl-4,6-dimethylphenol	250-2		
6-Methyl-2,4,5-triethylphenol	252		
2,6-Di-tert-butylphenol	253		94-8$_{5.6}$
3,4-Dimethylcatechol	253		
3,4-Dimethyl-6-isopropylphenol	250-0.5$_{745}$		
2,6-Di-n-propylphenol	256$_{764}$		121$_{10}$
5-Indanol	255		
4-tert-Butyl-4-sec-butylphenol	255-6		
4-tert-Butyl-2-ethylphenol	257	184	141
3-Methyl-2,4,6-triethylphenol	256-8		
3-Isobutyl-5-methylphenol			142-4
2-tert-Butyl-3,4-dimethylphenol	258	187	144.7
2,6-di-n-Propyl-4-methylphenol			138-42$_{17}$
4-tert-Butyl-2,3-dimethylphenol			145
4-n-Butyl-2,6-dimethylphenol			138-46
2-tert-Butyl-4-isobutylphenol	259-60		105-6$_{2.5}$
2,4-di-Isopropyl-6-methylphenol	253-6$_{745}$		
3-Methyl-2-ethyl-5-isopropylphenol			150-3$_{26}$
2,3,4,5-Tetramethylphenol	260		
3,5-Dimethylcatechol	261		

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